Quantifying determinants of social conformity in an online debating website

Senuri Wijenayake [*,a], Niels van Berkel [b], Vassilis Kostakos [a], Jorge Goncalves [a]

[a] *The University of Melbourne, Victoria, Australia*
[b] *Aalborg University, Aalborg, Denmark*

A B S T R A C T

Social conformity is the act of individuals adjusting their personal opinions to agree with an opposing majority. Previous work has identified multiple determinants of social conformity in controlled laboratory studies, but they remain largely untested in naturalistic online environments. For this study, we developed a realistic debating website, which 48 participants used for one week. We deployed four versions of the website using a 2 (*high* vs. *low* social presence) x 2 (*high* vs. *low* emphasis on majority–minority group composition) between-subjects factorial design. We found that participants were significantly more likely to conform when the platform promotes high social presence, despite its emphasis on group composition. Our qualitative findings further reveal how different aspects of social presence embedded in platform design (*i.e.,* user representation, interactivity, and response visibility) contribute to heightened conformity behaviour. Our results provide evidence of the organic manifestation of conformity in online groups discussing subjective content and confirm the effect of platform design on online conformity behaviour. We conclude with a discussion on the implications of our findings on how future online platforms can be designed accounting for conformity influences.

1. Introduction

Social conformity is the act of changing one's personal opinion when challenged by a contradicting group majority (Asch, 1951). Deutsch and Gerard (1955) explain that individuals conform either because they believe the majority's judgements to be 'correct' in ambiguous situations (*informational* conformity), or as they attempt to 'fit in' by agreeing to positive expectations of the group (*normative* conformity). While the majority of work on social conformity is based on offline group settings (Asch, 1951; 1955; Insko et al., 1985; Mullen, 1983; Rosenberg, 1961), understanding the effects of social conformity on online group interactions is vital due to the proliferation of online platforms (Brzozowski et al., 2015; Goncalves et al., 2013; Gooch et al., 2020; Reynolds et al., 2011; Sanders et al., 2020).

Recent work shows that conformity manifests in diverse online group settings such as learning platforms (Beran et al., 2015; Rosander and Eriksson, 2012; Wijenayake et al., 2019; 2020b; 2020c), discussion forums and support groups (Laporte et al., 2010; Sharma and De Choudhury, 2018; Sukumaran et al., 2011), and social networks (Colliander, 2019; Maruyama et al., 2017; 2014; Wijenayake et al., 2020d).

However, these studies have primarily focused on quantifying determinants of social conformity in controlled online group settings, looking at factors such as majority group size (Rosander and Eriksson, 2012; Wijenayake et al., 2019; 2020b; 2020c; 2020d), social presence (Laporte et al., 2010; Lee and Nass, 2002; Wijenayake et al., 2020c), self-confidence (Lee, 2004; Wijenayake et al., 2019; 2020b; 2020c; 2020d), and gender (Lee, 2003; 2004; 2007; Rosander and Eriksson, 2012; Wijenayake et al., 2019). Much of this work was conducted under strict laboratory settings using either confederates to simulate group members or fabricated illustrations (*e.g.* bar charts) to denote majority-minority group compositions (Beran et al., 2015; Colliander, 2019; Laporte et al., 2010; Lee, 2004; Rosander and Eriksson, 2012; Wijenayake et al., 2019; 2020b; 2020c). Thus, it remains unclear whether findings from such controlled setups generalise to realistic online group settings. Furthermore, prior work has also established that conformity has both positive and negative implications for online group interactions, such as enhancing a sense of community in online support groups (Sharma and De Choudhury, 2018) or being detrimental to the performance of students in online quizzes (Beran et al., 2015; Wijenayake et al., 2019). Therefore, it is of increasing interest to the

* Corresponding author.
E-mail addresses: swijenayake@student.unimelb.edu.au (S. Wijenayake), nielsvanberkel@cs.aau.dk (N. Berkel), vassilis.kostakos@unimelb.edu.au (V. Kostakos), jorge.goncalves@unimelb.edu.au (J. Goncalves).

HCI/CSCW research community to investigate how identified determinants of online social conformity (*e.g.*, online social presence, group composition) manifest through online platform design to influence user conformity - opening up the possibility of designing future online group settings accounting for conformity effects to ensure positive social interactions.

In this study, we investigate how conformity manifests in an online debating website where users are naturalistically exposed to each others' opinions on debated topics. We deployed four design variations of the website using a 2 (*high* vs. *low* social presence) x 2 (*high* vs. *low* emphasis on majority-minority group composition) factorial design, to analyse how two known determinants of online conformity embedded in platform design affect user conformity behaviour. The experiment was conducted online over a period of one week. Participants engaged in bilateral debates, accessing the website remotely from their everyday settings at a time convenient to them (asynchronously), further ensuring the ecological validity of our experimental setup in contrast to lab-based setups used in prior work (Laporte et al., 2010; Lee, 2004; Rosander and Eriksson, 2012; Wijenayake et al., 2019; 2020b; 2020c). Moreover, we allowed majority-minority group compositions to manifest organically based on participants' initial responses to debated topics, without using confederates or fabricated illustrations (as previously used by Beran et al., 2015; Colliander, 2019; Laporte et al., 2010; Rosander and Eriksson, 2012; Wijenayake et al., 2019; Wijenayake et al., 2020b; Wijenayake et al., 2020c). Furthermore, the bilateral and asynchronous nature of debates, and the platform designs used to simulate *high* vs. *low* social presence and emphasis on group compositions are based on popular debating websites and discussion forums (*e.g.*, Kialo [1], Debate.org [2], Quora [3], Stack Overflow [4], Reddit [5]), to further ensure the generalisability of our findings to realistic online groups.

The contribution of this study is threefold. First, we confirm that conformity manifests in realistic online group settings when users are exposed to others' opinions. Second, we provide evidence that online conformity can be influenced by the level of social presence offered through online platform design, independent of factors such as group composition and self-confidence. Third, we discuss how specific design elements contributing to online social presence influenced user conformity behaviour.

Our findings inform how different online group settings can be designed, capitalising on social conformity effects to promote positive social interactions. For instance, a platform design promoting high social presence may be particularly useful in settings where encouraging *normative* conformity is important, such as in online support groups (Sharma and De Choudhury, 2018; Sukumaran et al., 2011). Conversely, in online learning platforms and discussion forums where conforming to group opinions could lead to echo chambers and incorrect judgements (Beran et al., 2015; Wijenayake et al., 2019), the level of social presence could be moderated through platform design to minimise detrimental effects of conformity behaviour.

2. Related work

Social conformity is a powerful social influence that was initially observed in offline groups (Asch, 1951; 1955; Insko et al., 1985; Mullen, 1983; Rosenberg, 1961). In a seminal study that investigated the effect of group opinions on individual judgements, Asch (1951) established that clearly incorrect yet unanimous group majorities provoke conformity behaviour in offline settings.

Despite inherent differences between offline and online groups with

regard to (perceived) anonymity and reduced social presence offered in the latter (McKenna and Green, 2002), conformity behaviour has also been observed in diverse online group settings. For instance, a recent study by Wijenayake et al. (2019) notes how students often conform to the majority's answers in online quizzes containing objective questions presuming the majority to be 'correct', indicating effects of *informational* conformity. Moreover, Zhu et al. (2012) emphasise that even when required to make online choices based on personal preference, individuals tend to align their choices with those of the majority's after viewing opposing recommendations. Similarly, Maruyama et al. (2014) note that people who actively use Twitter to discuss political debates tend to often adjust their voting choices to reflect the majority's sentiment on Twitter. Another study reports similar observations in a social watching experiment, where individuals adopted views expressed on a Twitter feed by unknown users, despite their own attitude, knowledge, and interest on the topic (Maruyama et al., 2017).

Furthermore, prior work investigating the implications of online social conformity suggests the potential for both positive and negative effects. For instance, Sukumaran et al. (2011) emphasise that displaying several high quality and 'thoughtful' comments underneath online news articles encourages subsequent users to post comments with similar quality and thoughtfulness, highlighting positive effects of *normative* conformity. Similarly, previous work has shown that Facebook users tend to adjust how they perceive and respond to news articles on Facebook based on the majority's supportive or critical sentiment on the article (Colliander, 2019; Wijenayake et al., 2020d). The authors highlight that conformity is a more effective mechanism to mitigate the dispersion of fake news, than displaying a disclaimer alerting individuals that the article might be fake. Another study by Sharma and De Choudhury (2018) shows that conforming to the accepted conventions of behaviour and linguistic norms promotes a sense of belonging and security within online support groups, so that sensitive issues can be more openly discussed.

However, social conformity is not desired in certain other online settings. A study examining the effect of social information on the accuracy of a visual judgement task indicates that conforming to biased and incorrect responses from peers led to more errors among Mechanical Turk users (Hullman et al., 2011). Similarly, Beran et al. (2015) note how displaying peer answers to students when completing an online quiz resulted in fewer correct answers among students who conformed to the majority's answers, than students who answered the quiz independently. Similar results were observed by Wijenayake et al. (2019), where detrimental effects of conforming to the majority's answers in an online quiz were exacerbated due to gender stereotypical perceptions.

Therefore, given its double-edged nature, social conformity is a phenomenon that needs to be considered when designing online group settings to ensure positive social interactions. This study takes an initial step towards understanding how social conformity determinants manifest through online platform design, consequently influencing user conformity behaviour. Hence, we next summarise the existing literature on the major determinants of social conformity that informed the design of our platform.

2.1. Determinants of online social conformity

2.1.1. Group composition and self-confidence

Prior work on social conformity in both offline and online settings identify majority-minority group composition as a significant determinant of conformity behaviour (Asch, 1951; 1955; Goldberg, 1954; Insko et al., 1985; Mullen, 1983; Rosenberg, 1961; Wijenayake et al., 2019; 2020b; 2020c; 2020d). Studies investigating social conformity in controlled offline settings emphasise that larger unanimous majorities lead to higher conformity (Asch, 1951; Insko et al., 1985; Mullen, 1983; Rosenberg, 1961). A more recent study by Wijenayake et al. (2020b) extended these observations to online groups. In an online quiz containing both objective and subjective questions, researchers displayed

---

[1] https://www.kialo.com
[2] https://www.debate.org
[3] https://www.quora.com
[4] https://stackoverflow.com
[5] https://www.reddit.com

fabricated bar charts denoting diverse majority-minority group compositions (*e.g.*, majority of 90% against a minority of 10%, majority of 55% against a minority of 45% etc.) to assess the effect of majority size on conformity behaviour in the presence of minorities. Their findings confirmed that individuals are more likely to conform to larger majorities than smaller majorities, and that the number and the size of minorities do not matter. In another study investigating online social conformity, researchers found that individuals are more likely to conform as the group size difference between the majority and the minority increases (Wijenayake et al., 2019). The authors note that participants explained that their decision to conform was driven by the number of others opposing to (*i.e.*, the majority) and supporting (*i.e.*, the minority) their responses.

However, in the aforementioned studies the majority group size, as well as the number and the size of minorities displayed were fabricated to gain control over the group compositions being tested. Moreover, these studies illustrated the (fabricated) majority-minority group compositions to participants using bar charts (Rosander and Eriksson, 2012; Wijenayake et al., 2020b) and by organising gendered avatars into groups (Wijenayake et al., 2019) - methods that are not representative of how majority-minority group compositions manifest in realistic online settings. Hence, in this study we aim to investigate how majority-minority group compositions, when allowed to manifest organically (without fabricating group compositions) and presented similarly to realistic online platforms (such as Debate.org and Kialo), may influence user conformity behaviour.

Literature has also highlighted the effect of participants' confidence on personal answers on their conformity behaviour in both offline (Campbell et al., 1986; Tesser et al., 1983) and online (Lee, 2004; Wijenayake et al., 2019; 2020b; 2020c; 2020d) group settings. These studies unanimously state that participants who are confident in their personal answers before being exposed to group's feedback are less inclined to conform to the majority. Hence, it is a critical determinant of conformity that needs to be accounted for when investigating social conformity, and is therefore one of the constructs considered in our study.

2.1.2. Social presence

Short et al. (1976) identified social presence as one of the most fundamental aspects of interpersonal computer-mediated communication (CMC). It is defined as the 'degree of awareness of another person' and the 'sense of being connected to others via mediated communication' (Short et al., 1976; Tu and McIsaac, 2002). While many factors like facial expressions, posture, gaze, and nonverbal cues contribute to social presence in face-to-face groups, CMC was initially considered 'impersonal'. This notion was disproved by subsequent studies that recognised online social presence to be multifaceted in nature, and manifest across several dimensions such as social context cues, online communication, interactivity, and privacy (Gunawardena, 1995; Gunawardena and Zittle, 1997; Tu and McIsaac, 2002). More importantly, Connell et al. (2001) observed that CMC mediums that offer high social presence are more likely to result in socially desirable behaviour among its users. Since then, literature has attempted to understand how certain aspects of online social presence such as *user representation* (Gong, 2008; Lee and Nass, 2002), *interactivity* (Laporte et al., 2010; Wijenayake et al., 2020c), and *response visibility* (Lee and Nass, 2002; Wijenayake et al., 2020c) may impact online conformity behaviour. We next summarise the aforementioned prior work, emphasising how our study aims to extend their findings to realistic online settings.

User Representation: Online user representations are a form of social context cues that significantly contribute towards perceived online social presence among users (Gunawardena, 1995). More specifically, prior studies note that the degree of anthropomorphism offered by online user representations affect their social influence and perceived trustworthiness such that highly anthropomorphic (human-like) representations with more social context cues enhance perceived social presence among users resulting in frequent social responses, greater social influence and higher ratings in perceived trustworthiness (Gong, 2008). Similar findings were presented by Lee and Nass (2002), where participants identified online partners represented using high anthropomorphic user representations more socially attractive and trustworthy, consequently displaying greater agreement with them. However, the user representations used in the above studies were computer-synthesised facial images (Gong, 2008), stick figures and animated characters (Lee and Nass, 2002), that do not accurately represent the richness of user representations currently used in realistic online group settings. Conversely, in this study we utilise two realistic user representations with high and low anthropomorphism - real photographs and names of users, and a generic gender-neutral avatar with random usernames (as seen Reddit and Debate.org) respectively - to compare their effects on perceived social presence and resulting conformity behaviour.

Interactivity: As per Tu and McIsaac (2002), interactivity refers to 'activities in which CMC users engage and the communication styles they use' and is a significant contributor to perceived online social presence. They describe that any means by which users provide and receive feedback add to the awareness of others (or social presence) on the platform. Furthermore, there is evidence in the literature that higher interactivity enhances online social presence leading to higher conformity behaviour (Laporte et al., 2010; Wijenayake et al., 2020c). For instance, a study by Wijenayake et al. (2020c) compared conformity behaviour in participants completing an online quiz under two conditions: in a unidirectional setting where participants could only see the answers of others (low interactivity), and in a bidirectional setting where participants were given an opportunity to discuss group responses through a live chat after displaying them (high interactivity). The researchers highlight that participants in high interactivity conditions were significantly more agreeable to the group's opinion as a result of the heightened social presence, than those in low interactivity conditions. Similar observations were reported by Laporte et al. (2010), noting higher conformity among participants who communicated through an interactive live video chat during a quiz, in comparison to participants who saw static profile pictures of others alongside their answers without further interaction. However, the above studies used confederates to simulate synchronous interactions with real participants in controlled lab settings, and hence do not represent realistic online groups. In our study we choose not to include confederates, but instead design a realistic platform for longitudinal, asynchronous engagement among users, to examine whether the above observations can be replicated in realistic online group settings.

Response Visibility: Conformity literature describe response visibility - *i.e.,* whether final responses of users upon displaying group responses is visible to the group (public) or not (private) (Deutsch and Gerard, 1955) - as a critical determinant of perceived social presence and social conformity in online group settings (Lee and Nass, 2002; Wijenayake et al., 2020c). A recent study exploring conformity behaviour in an online group quiz indicated that higher response visibility (publicly visible final responses) together with higher, synchronous interactivity (a real-time, text-based group discussion upon displaying group answers) resulted in higher conformity among participants (Wijenayake et al., 2020c). Authors explain that participants felt more pressure to conform when informed that their final answers will be visible to peers subsequent to a group discussion, in an effort to avoid disappointing the majority (*normative* conformity). Researchers further describe that higher response visibility added to participants' sense of awareness of others (*i.e.* social presence) as a result of which they were more susceptible to *normative* influences (the need to 'fit in'), in addition to the *informational* influences that often trigger conformity in online settings. However, while the above findings suggest that the effect of response visibility on social conformity depends on the level of interactivity among group members, their focus was limited to synchronous interactions among participants. Therefore, it is unclear how response

visibility impacts social conformity in the presence of asynchronous interactions - which we intend to investigate in this study.

In summary, prior studies in conformity literature have identified several determinants of online conformity in controlled group settings (*e.g.*, by fabricating majority-minority group sizes, using unrealistic user representations to denote group compositions, using confederates to simulate participants in controlled lab settings). However, it is yet to be understood whether observations of these studies hold in realistic online settings that allow organic manifestations of conformity. Furthermore, there is evidence in the literature that users are receptive to visual, textual, and interaction design features of online environments that are intentionally manipulated to trigger high vs. low levels of normative conformity (Sukumaran et al., 2011). Hence, investigating how popular determinants of social conformity can manifest through realistic online platform designs, could greatly inform the design of future online group settings accounting for both the positive and negative implications of social conformity (Colliander, 2019; Hullman et al., 2011; Sharma and De Choudhury, 2018; Sukumaran et al., 2011; Wijenayake et al., 2019).

3. Method

This study aims to determine how social conformity manifests in realistic online group settings, and to quantify the effect of platform design on conformity. The experimental task is online debating. Debates allow individuals to present their own opinions, while also exposing them to others' opinions - which may or may not align with their personal views - thus potentially giving rise to conformity.

3.1. Experimental task

All participants were instructed to register with our website and to participate in all the debates. When logging in, participants are taken to a "Home" page showing ten debating topics across five categories: religion, education, health, society, and technology (see Fig. 1). All topics and categories were extracted from Kialo - a popular debating website with over 2 million user contributions across 12,500 public debates. For each category considered, we chose the two most popularly debated topics (at the time) to ensure that issues of higher interest to the general public were included in the experiment.

To join a debate, a participant is required to provide their initial opinion on the topic following the steps illustrated in Fig. 2. First, they are asked to state their initial opinion of the debated statement ("Yes" if they agree or "No" if they disagree). Our decision to restrict the initial opinion to "Yes" or "No" reflects the bilateral nature of debates on existing platforms such as Kialo and Debate.org. Next, participants are required to provide a concise justification of their opinion, which upon submission is posted on the corresponding debate forum as their initial argument on the topic. At the same time, users are required to rate their
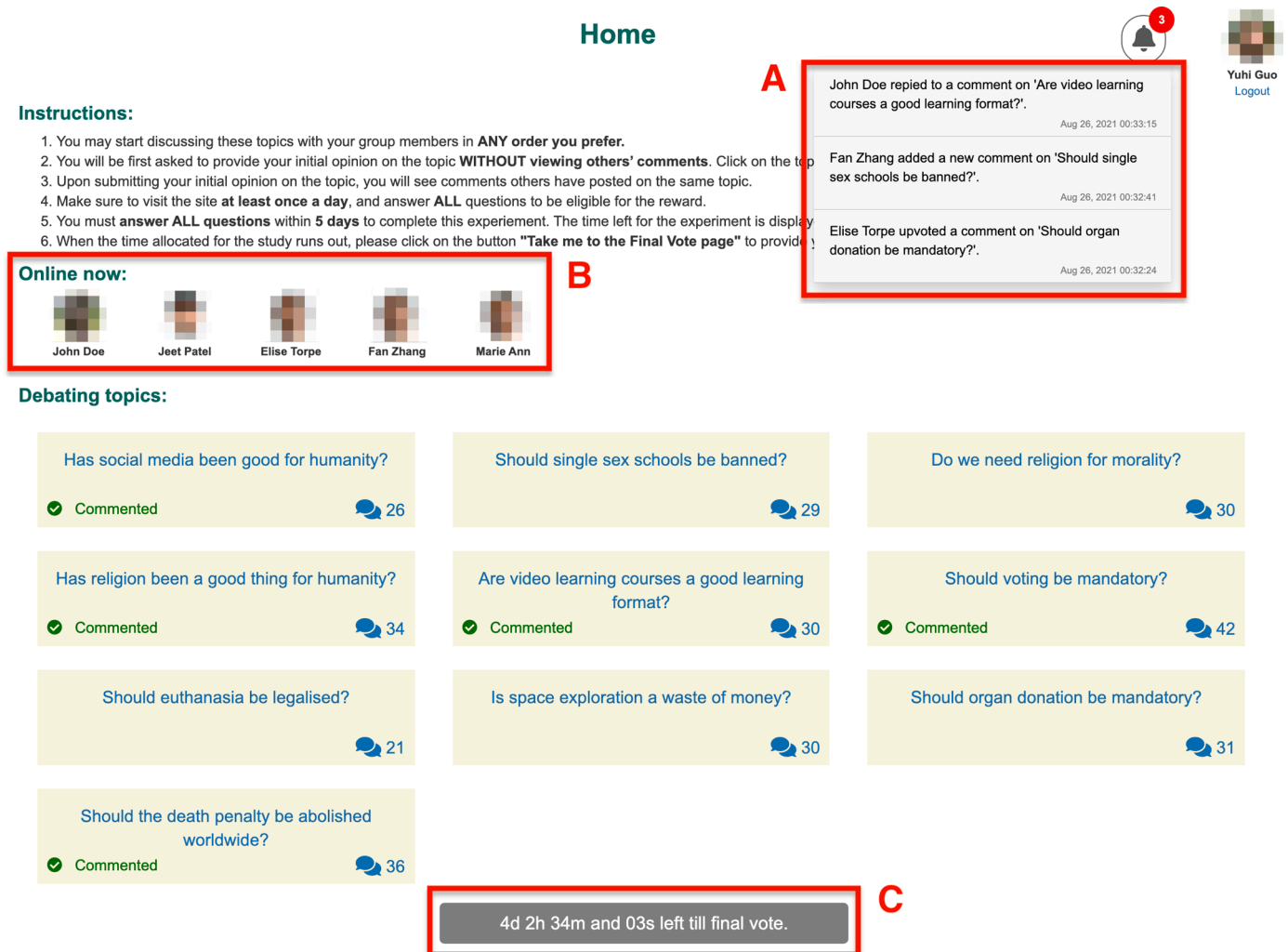

Fig. 1. Home page displayed to participants in *high* social presence conditions. Users could see others online at the time (B) and receive notifications of others' actions (A). These functionalities were not available in platform designs with *low* social presence. A timer at the bottom of the page (C) indicated the time remaining to complete the debate - regardless of the experimental condition.
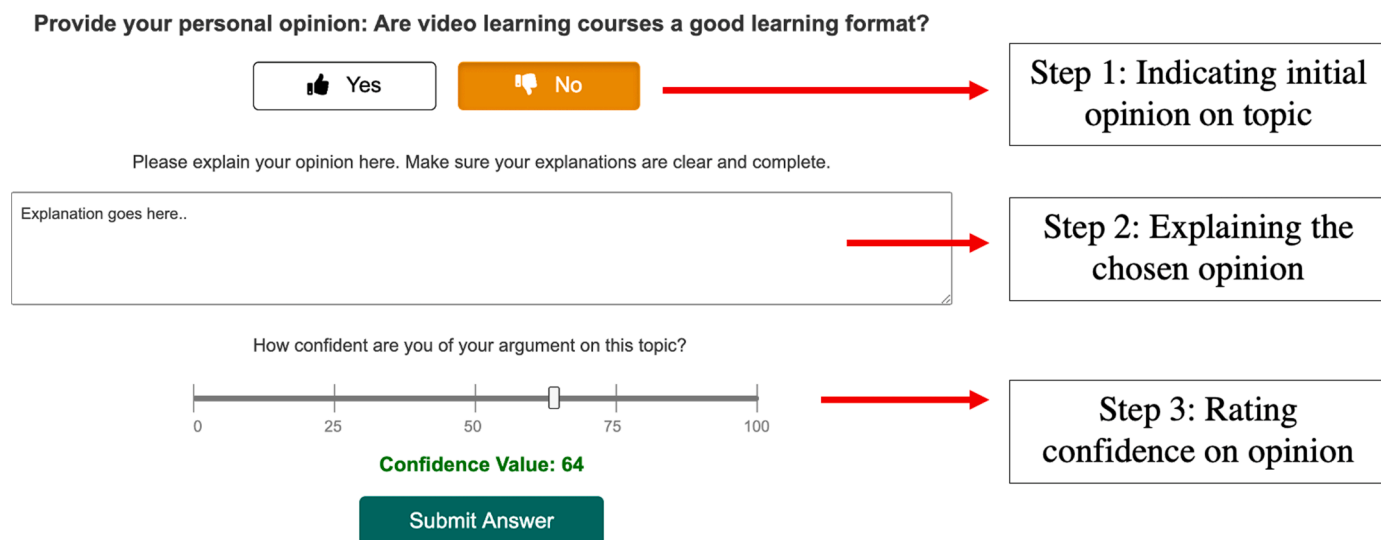
Provide your personal opinion: Are video learning courses a good learning format?

Fig. 2. Steps followed by participants to submit initial opinion on topic.

confidence in their initial opinion on a scale of 0 – 100 (with higher values representing higher levels of confidence) and submit their answer. After submitting their initial opinion, users gain full access to the debate forum where arguments of other users are also displayed. This process ensures that users' personal opinion on topics are captured without influence from others' opinions - an approach often used in prior conformity studies (Wijenayake et al., 2019; 2020b; 2020c; 2020d). Participants are instructed to debate on all the topics for a period of five days, and are asked to spend approximately 30 min per day using the platform.

On day 6 of the study, all participants are directed to a "Final Opinion" page. At this stage of the experiment, participants are given two days to read through all ten debates and provide their final opinion ("Yes" or "No"), rate their confidence in their final opinion (on a scale of 0 – 100), and justify their decision to change or not change their opinion after the debate. This process (also inspired by prior work (Wijenayake et al., 2019; 2020b; 2020c; 2020d)) allows us to capture how the debate may have influenced users' opinions and confidence on the topics discussed.

3.2. Experimental design

We deployed four versions of our online debating website utilising a 2 (*high* vs. *low* social presence) x 2 (*high* vs. *low* emphasis on majority-minority group composition) between-subjects factorial design. We chose to focus on online social presence and group composition as they have been identified as critical determinants of online social conformity (Laporte et al., 2010; Wijenayake et al., 2019; 2020b; 2020c), and can be realistically manipulated through platform design. Depending on the experimental condition to which users are assigned, the website design varies in terms of how others' opinions are presented in debate forums, as illustrated in Figs. 3–7.

3.2.1. Social presence

We manipulated three aspects of platform design known to affect social presence: user representation, interactivity, and response visibility (Deutsch and Gerard, 1955; Gunawardena, 1995; Laporte et al., 2010; Lee and Nass, 2002; Tu and McIsaac, 2002; Wijenayake et al., 2020c). In conditions with *high* social presence, the users' photographs and names are visible beside their comments (see Figure 3 & 4) - a form of **user representation** commonly seen in existing websites such as Kialo and Quora. This decision is also supported by literature explaining how high anthropomorphic (human-like) user representations increases

agency and social presence in online group settings (Gong, 2008; Lee and Nass, 2002; Nowak and Biocca, 2003).

Furthermore, prior work emphasise that higher **interactivity** enhances perceived social presence in online groups (Laporte et al., 2010; Wijenayake et al., 2020c). Hence, in conditions with *high* social presence users are able to upvote and downvote on opinions in addition to posting replies (see Figs. 3 & 4). Consequently, opinions posted on the forum are arranged based on the upvotes they receive so that more popular opinions are displayed on top. We also displayed photographs and names of users who are online at a given time, and informed users of others' actions on the platform (when others replied, upvoted, and downvoted on the forum) through a notification system (see Figure 1), to simulate a sense of interactivity - in an attempt to further enhance perceived online social presence.

Higher **response visibility** of final opinions has also been shown to enhance perceived social presence (Deutsch and Gerard, 1955; Lee and Nass, 2002; Wijenayake et al., 2020c). Therefore, participants assigned to *high* social presence conditions were informed that their final opinions will be visible to the rest of the group, and were subsequently shown final responses of others once they submit their own final opinion on a topic (see Fig. 5).

Alternatively, in *low* social presence conditions, generic avatars and random usernames of users are visible beside comments (see Figs. 6 & 7), as often seen in forums such as Reddit and Debate.org. Users can respond to others' opinions by replying to comments, but are not able to upvote and downvote them as seen in basic Canvas discussion forums (see Figs. 6 & 7). Consequently, in the absence of a voting mechanism, the comments are arranged based on the order in which they are posted on the forum (and not by their popularity). Finally, users of *low* social presence platforms are not shown others' final responses (no response visibility).

3.2.2. Emphasis on majority-minority group composition

We aim to investigate whether emphasising how users' initial opinions are distributed across the majority and the minority through realistic platform design can impact online conformity behaviour. Thus, we considered existing designs of debate and discussion platforms (*i.e.,* Kialo, Debate.org, Quora and Stack Overflow), and specifically focused on how they arrange user opinions. We decided that in conditions with *high* emphasis on majority-minority group composition, the user opinions would be segregated to two separate columns for "Yes" and "No", with a bar on top visualising the distribution of opinions across the two groups as shown in Figs. 4 & 7. The two-column design emphasises that
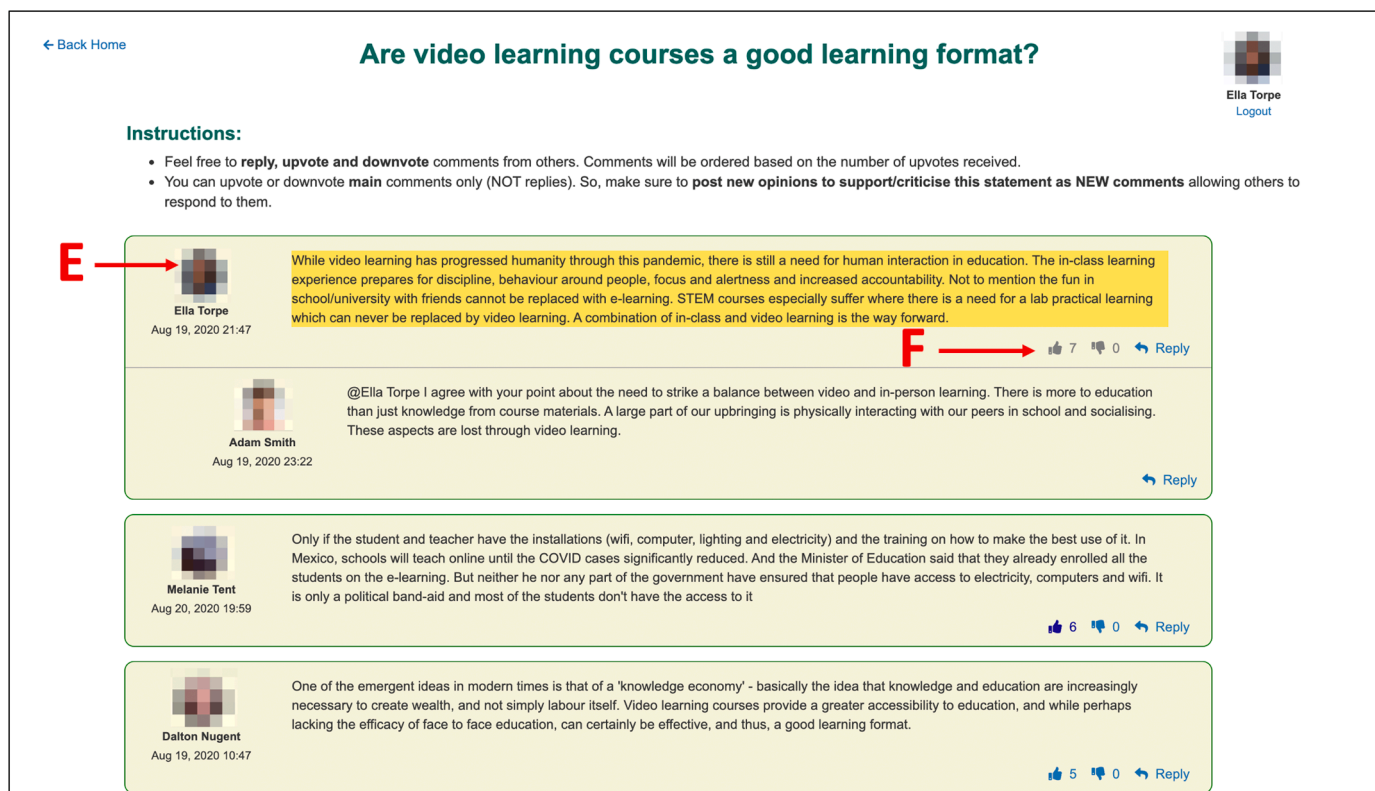
Fig. 3. User interface with *high* social presence and *low* emphasis on majority - minority group composition. High social presence is created using real user photographs and names (E), and a up/down voting mechanism, in addition to the "reply" option (F) to allow for more interaction between users. All user comments are sequentially arranged to create *low* emphasis on majority-minority group composition.

there are two distinct groups, while the bar on top illustrates the magnitude (or the size) of these groups - both visually and numerically - which naturally brings attention to the majority-minority group composition. Additionally, the fact that similar arrangements are used to present opinions in popular debating websites such as Kialo and Debate. org, ensures the realistic nature of the designs used in the experiment.

Alternatively, in *low* emphasis conditions, the user opinions are not segregated across two columns - similar to Quora and Stack Overflow - and the bar indicating the group distributions is not visible (see Figs. 3 & 6). Therefore, we argue that in comparison to the *high* emphasis condition, the presence and the magnitude of the majority-minority groups are less apparent in this design. On that note, we reiterate that in this study majority-minority groups manifested organically based on the initial opinions provided by the participants on each topic (see Fig. 2), without any manipulation by the experimenters. The platform design only manipulated how they are presented to the users (with either *low* or *high* emphasis on the group composition).

3.3. Participants and procedure

The experiment was approved by the Ethics Committee of our university. Each participant received a $40 e-gift voucher. We recruited 48 participants (24 men and 24 women) from a wide range of educational backgrounds, including Architecture, Agriculture, Arts, Science, Commerce, Engineering, Medicine, Law, Marketing, Music, and Public Health. Participants were between 18 – 39 years old, and were recruited through our university's online notice board. Because the true purpose of the study could not be disclosed (Stang, 1976), we explained that the study aims to investigate the effectiveness of online platforms for group discussions. Participants were equally and randomly distributed among the four debating platforms (with 6 women and 6 men per platform; each participant tested only one platform). Hence, each platform (or

experimental condition) had 12 distinct participants, which is in line with HCI standards (Caine, 2016).

Upon completing the experiment, participants were invited to a brief semi-structured interview conducted via Zoom [6] (20–25 min). In the interview, we inquired "whether they felt an urge to change their initial opinions on any of the topics after group debates", and if so "what factors made them change their opinions". We were particularly interested in "whether any of the platform's design elements affected their decision to change initial opinions" and encouraged them to further "elaborate which design elements motivated or discouraged conformity behaviour and how". Furthermore, after participants were given an opportunity to describe how the website design they interacted with affected their behaviour, we showed them screenshots of the website designs pertaining to other experimental conditions and asked them to elaborate on whether they would have behaved differently if they had interacted with these. We encouraged participants to reflect on how the presence or the absence of specific design elements - *i.e.*, the bar on top indicating majority-minority group distribution, segregated comments, use of generic avatars vs. real photographs, and the up/down voting mechanism - may have influenced their conforming behaviour during debates. Finally, we debriefed our participants on the true objective of the study. Participants were then given the opportunity to withdraw their participation and data collected during the study if desired, but none chose to do so.

4. Results

We collected the initial and final opinions of 48 participants on ten topics each, resulting in a total of 480 initial responses and 480 final

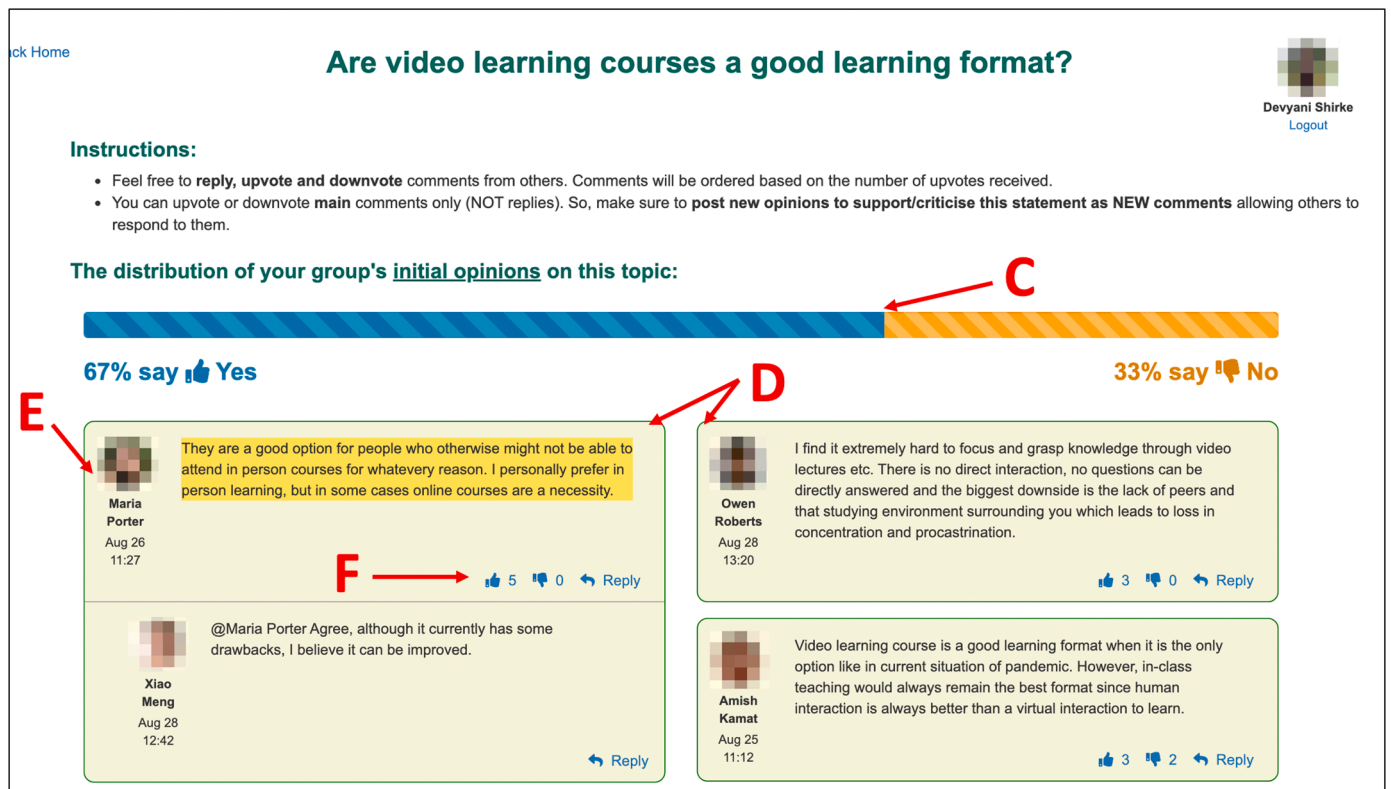---

[6] https://zoom.us

Fig. 4. User interface with *high* social presence and *high* emphasis on majority - minority group composition. *High* social presence is maintained using real user photographs and names (E), and a up/down voting mechanism, in addition to the "reply" option (F) to allow for more interaction between users. User comments "for" and "against" the topic are segregated into two columns (D) to create *high* emphasis on group composition. Additionally, the bar on top shows the majority-minority composition as percentages (C).
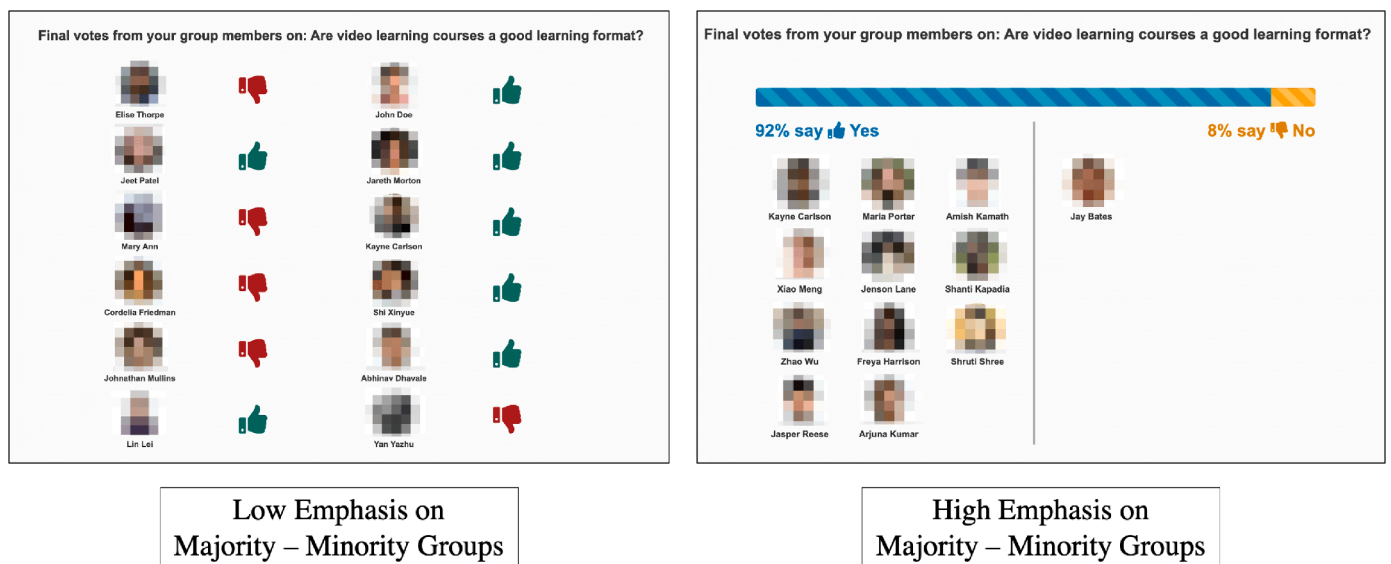

Fig. 5. Final opinions of the group are displayed in *high* social presence conditions (for response visibility) with either *low* or *high* emphasis on group composition.

responses (across four experimental conditions). On that note, we highlight that the majority-minority groups were formed based on the participants' initial opinions, and hence were not controlled in the study to ensure the ecological validity of the experimental setup. As a result, while other studies that investigated conformity in opinion-related tasks in controlled settings have placed participants in minorities in approximately 50% of the cases (Goodmon et al., 2020), our participants found themselves in the minority in only 25% of the cases (119/480), and in

the majority in 68% of responses (325/480). In the remaining 36 responses, participants' initial opinions were equally distributed among the two groups ("Yes" and "No") with no clear majority or minority. The distribution of the 119 minority responses across the four experimental conditions is given in Table 1.

After debating for five days, participants were required to indicate their final opinion and confidence in each topic, where they could:
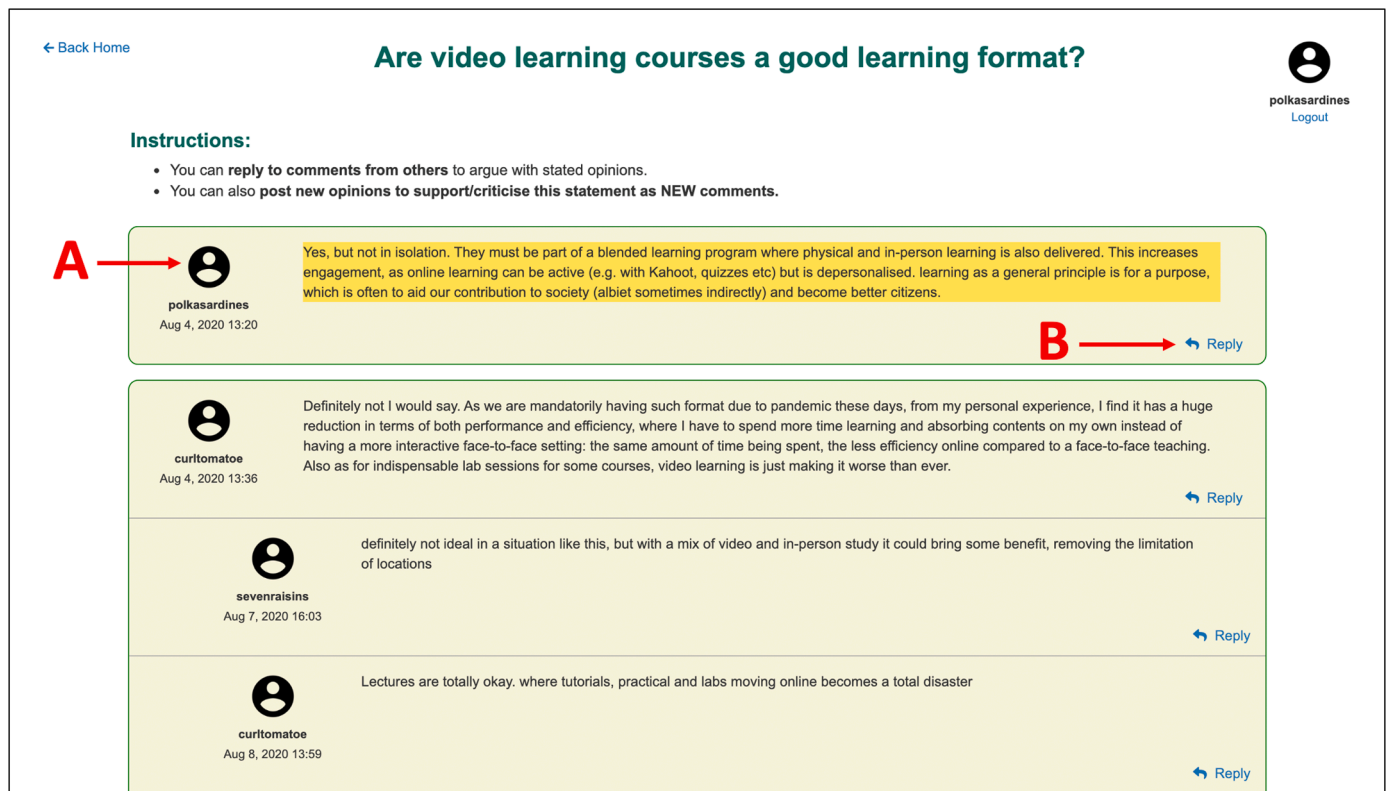
Fig. 6. User interface with *low* social presence and *low* emphasis on majority - minority group composition. *Low* social presence is created using generic user representations and usernames (A), and a "reply" option (B) to allow for minimal interaction between users. All user comments are sequentially arranged to create *low* emphasis on majority-minority group composition.

(a) Change both their initial opinion and confidence in opinion.
(b) Change only their initial opinion.
(c) Change only their confidence in opinion.
(d) Make no change to either their initial opinion or confidence level.

All participants changed their opinion, confidence level, or both at least once during the study, resulting in a total of 378 changed responses with an average of 7.9 changes ($SD = 2.0$) per participant. Figure 8 illustrates the distribution of the post-debate responses, grouped by whether participants' initial opinions were supported by a majority or a minority. When placed in minorities, participants were more likely to change their confidence in personal opinions ($M = -0.2$, $SD = 20.2$), with or without a change in opinion (in approximately 83% of responses). Alternatively, in approximately 95% of the instances when participants were supported by a majority, they would either make no change or only change their confidence level ($M = 8.5$, $SD = 15.3$). Furthermore, an ANOVA test compared the mean change in confidence (*i.e.*, confidence in final opinion – confidence in initial opinion) among participants placed in majorities and minorities. Results of the ANOVA indicate that being challenged by a majority significantly reduces participants' confidence in their final opinion (regardless of whether they change their final opinion or not), whereas they are more likely to increase their confidence in final opinion when supported by a majority ($F(1, 92) = 8.76$, $p = 0.004$).

For the purpose of this study, we define conformity as the act of changing one's initial opinion ("Yes" or "No") to that of the opposing majority. Our results show that 26 participants conformed at least once to the majority ($M = 1.4$, $SD = 0.6$), resulting in 37 conformity responses and an overall conformity rate of 31% - similar to conformity rates reported in recent studies investigating online social conformity (Wijenayake et al., 2019; 2020b; 2020c). The distribution of these conformity responses across the four experimental conditions is shown

in Table 1.

We then investigated the impact of the following variables on the conformity behaviour of our participants, which were chosen based on their relevance to the study's objective of quantifying the effect of platform design on online social conformity, and as per prior work on conformity determinants (Laporte et al., 2010; Wijenayake et al., 2019; 2020b; 2020c).

- **Social presence (SP)**: Level of social presence offered through platform design (values: *high* vs. *low*). Independent variable controlled in the experiment.
- **Emphasis on majority-minority group composition (E)**: Level of emphasis placed on the majority and the minority group sizes through platform design (values: *high* vs. *low*). Independent variable controlled in the experiment.
- **Group size difference**: Difference between the majority and minority group size (values: 2, 4, 6, 8, 10). Covariate.
- **Initial confidence**: Self-reported confidence in initial opinion (range: 24 – 100). Covariate.

We conducted a two-way ANCOVA on the minority responses to assess the true effect of the independent variables social presence (**SP**) and emphasis on group composition (**E**) on user conformity. We accounted for the covariates initial confidence and group size difference, which are established determinants of online social conformity (Lee, 2004; Wijenayake et al., 2019; 2020b; 2020c; 2020d) that we did not control in our experiment. We further note that the between-subjects experimental design ensured the independence of observations for a two-way ANCOVA between **SP** and **E**. Moreover, two-way ANCOVA is often used in CHI/CSCW literature with similar experimental setups (*e. g.*, Melcer and Isbister, 2018; Winkler et al., 2020; Yuan et al., 2016; Zhang and Xu, 2016) to identify statistically significant interaction
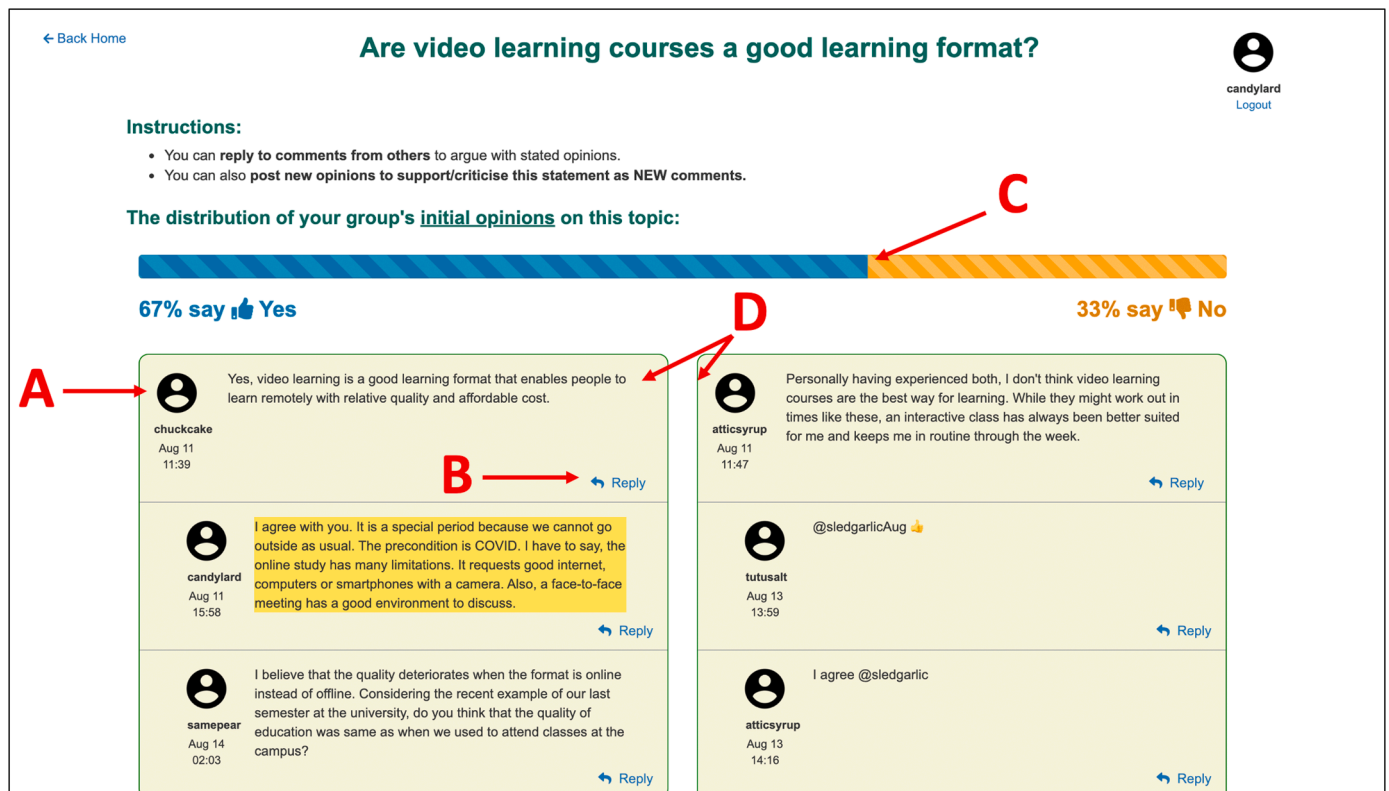
Fig. 7. User interface with *low* social presence and *high* emphasis on majority - minority group composition. *Low* social presence is maintained using generic user representations and usernames (A), and a "reply" option (B) to allow for minimal interaction between users. User comments "for" and "against" the topic are segregated into two columns (D) to create *high* emphasis on group composition. Additionally, the bar on top shows the majority-minority composition as percentages (C).

Table 1
Distribution of conformity responses across the four experimental conditions; SP = Social Presence, E = Emphasis on majority-minority group composition.

	Low SP x Low E	Low SP x High E	High SP x Low E	High SP x High E
# minority responses	28	28	28	35
# conformity responses	5	7	10	15
% of conformity	18%	25%	36%	43%

effects or main effects from two categorical independent variables (*i.e.,* in this case **SP** and **E**), in terms of a continuous dependent variable (*i.e.,* the number of conformity responses per topic), after controlling for continuous covariates (*i.e.,* group size difference and initial confidence). We confirm that our data meets all the assumptions of an ANCOVA (linearity, homogeneity of regression slopes, normality of residuals using Shapiro Wilk test, homogeneity of variances using a Levene's test). We report partial eta squared as a measure of the strength of an effect - *i.e.,* $0.01 =$ small, $0.06 =$ medium, $0.14 =$ large - as per Cohen (1988) and Winkler et al. (2020).

Our results do not indicate a statistically significant interaction effect between social presence and emphasis on majority-minority group composition on participant conformity, after controlling for the covariates initial confidence and group size difference ($F(1, 30) = 0.004, p = 0.948$). However, we observe a statistically significant main effect from social presence on participant conformity after adjustment for covariates ($F(1, 30) = 4.33, p = 0.046$), reporting a partial eta squared of 0.13 - a medium to large effect strength as per literature (Cohen, 1988; Winkler et al., 2020). We performed a post hoc analysis using Bonferroni adjustment to calculate the estimated marginal means (emmeans) for

the two levels of social presence (*high* and *low*). Results indicate that the average number of conformity responses per topic in *high* social presence conditions is significantly greater ($M = 1.36, SE = 0.21$) than in *low* social presence conditions ($M = 0.70, SE = 0.21$), $p = 0.034$, as shown in Fig. 9.

We also note that the level of emphasis on majority-minority group composition did not have a significant main effect on participant conformity ($F(1, 30) = 0.48, p = 0.494$).

Furthermore, the covariate group size difference had a statistically significant main effect on conformity behaviour ($F(1, 30) = 4.71, p = 0.038$), reporting a partial eta squared of 0.17 - a large effect strength (Cohen, 1988; Winkler et al., 2020). Upon further analysis of the data, we note that approximately 71% (85/119) of the minority responses placed participants in situations with group size differences of 2 and 4 (each with > 40 cases). Conversely, group size differences of 6, 8 and 10 did not contain sufficient data points for further analysis as a result of the uncontrolled nature of the study. Hence, we illustrate the effect of group size difference on participant conformity behaviour as a density plot (x = likelihood to conform) with two curves for group size differences 2 and 4 (means at 26% and 39% respectively) as shown in Fig. 10. The plot indicates that regardless of the platform design, participants were more inclined to conform to larger majorities (group size difference 4) than smaller majorities (group size difference 2).

Conversely, participants' initial confidence in opinion had no significant effect on conformity ($F(1, 30) = 0.12, p = 0.746$). Furthermore, a chi-square test of independence between topic categories and participant conformity showed no significant relationship between the two variables ($\chi^2(4) = 3.24, p = 0.519$).
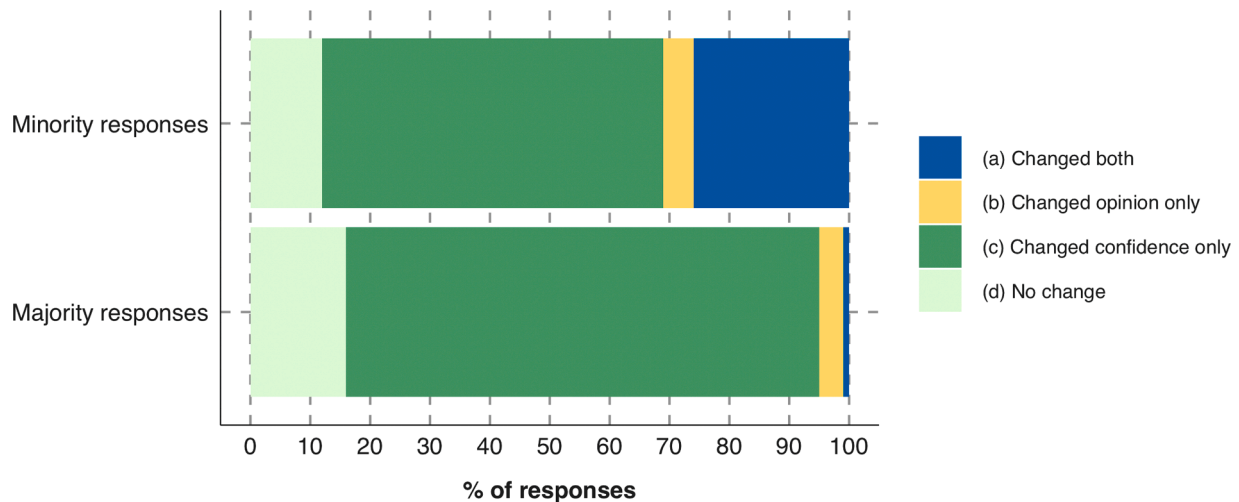
Fig. 8. Distribution of post-debate responses when participants' initial opinions were supported by a majority (majority responses) or a minority (minority responses).
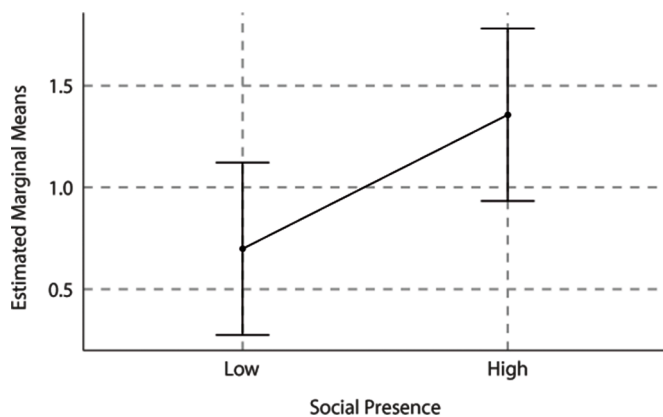

Fig. 9. Estimated marginal means for *high* vs. *low* social presence conditions. Error bars correspond to standard error (*SE*).

4.1. Qualitative analysis

One paper author conducted semi-structured interviews individually with each participant through Zoom (a video conferencing software) following completion of the study. The semi-structured interview focused on factors (design elements of the platform or otherwise) which participants believed to affect their shift in opinions and confidence. Two of the paper's authors individually transcribed and coded the interview data following a deductive thematic analysis approach (Braun and Clarke, 2006). We focused on how social presence and emphasis on group composition - two established conformity determinants as per Laporte et al. (2010); Wijenayake et al. (2019, 2020b, 2020c) - manipulated through platform design affected participant conformity, and evidence that the specific design elements used to stimulate *high* vs. *low* social presence and emphasis on group composition were successful. The emerging themes were subsequently combined in an online spreadsheet to aid further discussion and comparison. The two authors then collaboratively agreed on the final themes considered relevant to this paper. We present three main themes - how specific aspects of social presence (*i.e.,* user representations, interactivity and response visibility (Gunawardena, 1995; Tu and McIsaac, 2002; Wijenayake et al., 2020c)) contributed towards participants' perceived online social presence consequently affecting their conformity behaviour, success of the manipulations used to emphasise on group composition and their effect on participant behaviour, and how participants' position in majority-minority groups influenced their confidence in opinions.

4.1.1. Social presence

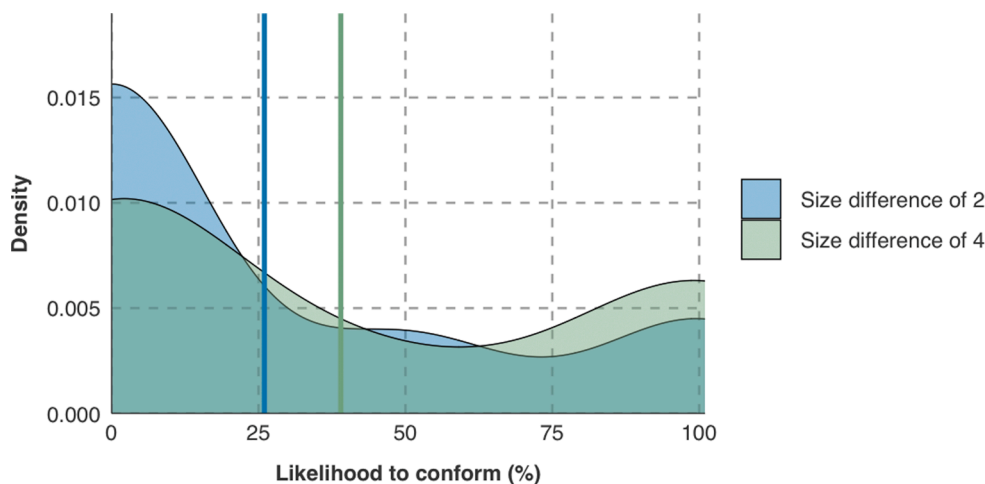One of the critical elements of perceived online social presence is

Fig. 10. Effect of majority-minority group size difference on the participants' likelihood to conform.

user representation (Gong, 2008; Gunawardena, 1995; Lee and Nass, 2002). Our interview data indicate that the user representations used in the study successfully insinuated perceptions of *high* vs. *low* online social presence among participants in respective experimental conditions. For instance, participants in the *high* social presence conditions highlighted that the use of profile pictures created a more social environment, which was "*making the discussion more human*" (P32), ensuring a human element in digital interaction. They further note that using real photos of themselves during the debate made them feel more connected to others, indicating enhanced perceived social presence; "*it felt like you are talking to another person*" (P37) and "*in a way I felt more connected to people*" (P26). This stands in high contrast with the comments from some of the participants in the *low* social presence conditions who described the use of generic avatars and random usernames as impersonal, implying diminished perceptions of online social presence; "*I think the generic avatars made the experience a bit depersonalised.*" (P01) and "*in the absence of real photos, it was like talking to a random robot or to an AI.*" (P43).

Furthermore, the use of profile pictures and names increased the perceived level of accountability of opinions among participants, in comparison to generic avatars and random usernames; "*I feel [displaying profile pictures and names] is better because you think about things before you say anything because people can see your real name. It is about your own reputation.*" (P27) and "*if it was a random picture or a username, it does not matter what I really put up as it has nothing to do with me.*" (P25). Several of the participants also commented on the fact that the presence of a profile picture withheld them from posting certain viewpoints and structure their responses diligently; "*I was more careful and tried to polish my responses, especially for sensitive topics where you do not want to hurt others' opinions.*" (P48). In contrast, participants in *low* social presence conditions mentioned being more aggressive and blunt in their arguments as a result of the visual anonymity offered by generic avatars and random usernames; "*I definitely think if your picture and name is not there you become a bit more bold and post opinions that you do no want to identify yourself with publicly.*" (P46).

Consequently, the user representations used in the platforms influenced participants' susceptibility to conformity influences. Some participants indicated that public profile pictures increased their wish to join in with the majority - signifying the impact of increased social presence on conformity behaviour; "*with pictures, they would also know what I look like and since this is a public thing, I didn't want to look bad. And this made me want to fit in more with the majority.*" (P01). On the other hand, participants in *low* social presence conditions mentioned that anonymity reduced the influence of others' opinions, consequently reducing the perceived pressure to conform to popular opinions; "*with generic avatar I did not take others' opinions too seriously or engage with them as much because it takes away a lot of credibility for me.*" (P26) and "*I like the anonymity, so that I could put my opinion out there despite it being unpopular.*" (P35).

Another important element of social presence is the ability to provide and receive feedback on opinions (or **interactivity**) (Laporte et al., 2010; Tu and McIsaac, 2002; Wijenayake et al., 2020c), which we enabled through the ability to reply to opinions (in *low* social presence conditions), and the ability to upvote or downvote others' opinions (an additional feature provided only in *high* social presence conditions). While all participants agreed that replying to opinions made it "*easy to connect with others directly*" (P47) - establishing its contribution to perceived online social presence - participants in *high* social presence conditions (who could both reply and vote on other opinions) emphasised that the voting mechanism provided a stronger sense of interaction and engagement with others' opinions during debates; "*The upvoting contributed towards engagement as I could see that people were reading the responses and that they were engaged in the debate.*" (P26). They also described the voting mechanism as a "*good way to show agreement or disagreement with another opinion*" (P29) and a "*more efficient way of interacting with others than posting replies*" (P31) - especially when they had no new information to add to an argument; "*I think voting also

contributed towards engagement. You might not have something new to add, but would still want to show you have read and support their opinion - and upvotes facilitate that.*" (P32). Furthermore, the majority of participants also commented that seeing certain opinions receive high support (or more upvotes) from the group significantly encouraged them to adopt the said opinions during the debate to receive similar support; "*Even in day to day life if you see that there is somebody who is getting a lot of appreciation on something, you would want be like that. So I tried to mimic opinions that received more upvotes.*" (P34). Hence, our findings suggest that the interactivity added by the voting mechanism used in *high* social presence conditions may have enhanced participants' susceptibility to *normative* conformity influences.

On a different note, our interviews seem to indicate that displaying the online status of others and using a notification system in *high* social presence conditions did not largely affect participant behaviour in relation to the debate. Participants explained that seeing the online status of users contributed towards engagement among users, but did not add any new information to the debate; "*I was more engaged because I waited for a while when I saw others online, expecting them to respond to my comments.*" (P46) and "*I did not have a specific feeling towards [seeing others online]. Seeing their comments with faces and names was enough.*" (P41). Similarly, participants stated that receiving notifications had both upsides and downsides; "*the helpful part was that it reminded me to join the discussion. But, seeing how everyone else was working on the debates also added pressure.*" (P28). Thus, these design elements seem comparatively less successful in implying interactivity among users.

Furthermore, we note mixed effects from **response visibility** - the third aspect of social presence considered (Lee and Nass, 2002; Wijenayake et al., 2020c) - on perceived online social presence and conformity behaviour among participants. The majority of the participants note that while they preferred the visibility of final opinions, it did not influence their subsequent conformity behaviour; "*it was pretty interesting to see how the discussion has changed or not changed the opinions and the distribution. But I do not think seeing the final votes, would influence how I vote next because the topics are separate to each other.*" (P39). Therefore, while the visibility of final opinions may have contributed towards perceived online social presence, its effect on conformity does not appear significant.

4.1.2. Emphasis on group composition

The social conformity literature has long stressed the effect of group size (*i.e.*, majority vs. minority composition) on participant conformity behaviour (Asch, 1955; Insko et al., 1985; Wijenayake et al., 2019; 2020b; 2020c). In our study, group size was explicit for half of the participants (with "Yes" and "No" opinions segregated into two separate columns, and a bar on top visualising their distribution), whereas the other half used a design with a low emphasis on majority-minority groups (with no segregation between "Yes" and "No" opinions and no visualisations of their distribution). Our qualitative analysis indicate that the design manipulations used in this study to insinuate *high* and *low* emphasis on group compositions were successful. For instance, a number of participants found that the lack of distinction between 'for' and 'against' opinions in *low* emphasis conditions reduced the overall clarity and did not allow for an immediate assessment of the group's overall opinion; "*The [low emphasis] design was complex, because it was harder to understand which side they were on just by reading the opinion.*" (P30). Conversely, participants in *high* emphasis conditions highlighted that the platform design itself emphasised how one's opinion compared with the group's overall opinion; "*I was more aware of what others think in the [high emphasis] design. I knew the exact proportion of the group I fell into, and felt pressured to change my answers when a lot of others disagreed with my opinion.*" (P27).

Moreover, while our statistical analysis did not indicate a significant effect from the design differences in *high* vs. *low* emphasis conditions on participant conformity, our interview data imply that they influenced how participants interacted with the platform. For instance, the design

differences in group composition affected how participants perceived the platform's goal - a discussion with *low* emphasis on group segregation vs. a debate with *high* emphasis on differences in opinion; "*for discussion, I think the [low emphasis] version is better because you don't feel the pressure from others' opinions. In the [high emphasis] format, there are obvious two sides and the pressure of a debate is more apparent.*" (P28).

Furthermore, participants for which the design strongly highlighted the majority-minority group differences often described that the awareness of group compositions pressured them to conform when in a minority; "*when I saw a tiny proportion of opinions on my side and so many others in the opposite side, I felt the pressure to change as I have chosen the minority.*" (P24). In particular, participants described that the top bar visualising the majority-minority group composition contributed towards this sentiment; "*I think the bar at the top saying 92% said 'Yes' and 8% said 'No' was quite striking. It definitely influenced my perspective.*" (P20) and "*I like the bar with the statistics - but it also made me feel pressured to follow the majority and not follow what I initially thought of.*" (P33). Interestingly, these participants also mentioned using the distinction between the two groups to select which comments to read when placed in a majority – choosing only to engage with comments on the agreeing side; "*When I was in the majority, I did not pay much attention to other opinions. I just went through the comments that agreed with my opinion to confirm my own opinion.*" (P48).

On the other hand, participants in *low* emphasis conditions claimed that the absence of segregation between majority-minority groups allowed free expression of opinions, reducing the pressure to conform; "*the [low emphasis] design is a continuous series of comments like in social media and there is freedom to state our own opinion. In the [high emphasis] design when a lot of people are saying 'Yes' and if I say 'No', there is more pressure to change to the majority's opinion.*" (P07).

4.1.3. Confidence in opinions

We observed no significant effect from participants' confidence in personal opinion on their conformity behaviour in our statistical analysis, despite self-confidence being highlighted in literature as a critical conformity determinant (Campbell et al., 1986; Lee, 2004; Tesser et al., 1983; Wijenayake et al., 2019; 2020b; 2020c). In our interviews, participants rationalised that they were generally quite confident of their initial opinions given the subjective nature of the discussion topics; "*for a lot of these questions it is how you see the world and your personal values - and I have established my views based on experience for a long time already and a few days debate won't change my opinions.*" (P14). However, they also described that the perceived sensitivity of certain topics made them doubt initial opinions; "*for some topics like religion and euthanasia ones, I was not confident of my initial opinion anyway, so there was more chance to change my opinion in them.*" (P19).

Moreover, participants also mentioned how being in the minority and the majority differently influenced their confidence in opinions. They described that being challenged by a majority motivated them to reconsider their initial opinion – something they were less likely to do when part of the majority; "*after choosing my answer if I saw many people supporting me, I became very confident. If there are more people disagreeing with me, I might think I made a wrong choice or that I did not consider other perspectives.*" (P15).

5. Discussion

Thus far, social conformity has been investigated in controlled laboratory settings that used fabricated bar charts or confederates pretending to be users to create social pressure situations, in an attempt to identify effects of conformity determinants *i.e.*, social presence (Laporte et al., 2010; Wijenayake et al., 2020c), majority-minority group composition (Rosander and Eriksson, 2012; Wijenayake et al., 2020b), and self-confidence (Lee, 2004; Wijenayake et al., 2019). However, as controlled laboratory settings do not accurately represent realistic online environment, and can induce unusual user behaviours as a result of

experimenter effects and suspicion of experimental manipulations (Stang, 1976; Wijenayake et al., 2020a), it is unclear whether the findings of these laboratory studies can be generalised to realistic online groups settings.

Moreover, as literature emphasises that conformity behaviour can elicit both positive (*i.e.* enhanced sense of community (Sharma and De Choudhury, 2018)) and negative (*i.e.* undue pressure to conform to incorrect group judgements (Hullman et al., 2011; Wijenayake et al., 2019)) consequences in online groups, it is important to understand how platforms can be designed to control conformity influences appropriately and facilitate positive social interactions. However, while prior work shows that conveying social information through online platform design can enhance task performance (Diner et al., 2018) and engagement (Farzan et al., 2011) in tasks of objective nature, whether conformity influences insinuated through platform design can induce opinion change in subjective topics was not clear.

Hence, this study took a novel approach to investigate how conformity behaviour manifests in a realistic online debating platform that inherently exposed users to opposing opinions. Users accessed the platform remotely (with no involvement from the experimenter) when convenient to them (asynchronously), to indicate their opinions on subjective topics of societal interest, both before and after being exposed to naturally occurring peer opinions. Moreover, in contrast to prior work (*i.e.*, Laporte et al., 2010; Wijenayake et al., 2020b), majority-minority groups manifested organically based on the initial opinions of participants on each topic (without the use of confederates or simulations) - hence minimising reason for suspicion. Furthermore, to test for effects of platform design on online social conformity, four design variations of the debating platform were deployed. Each design variation tested a unique combination of *high* vs. *low* social presence and *high* vs. *low* emphasis on majority-minority group composition (two popular conformity determinants), while closely replicating designs of real-world debating platforms and discussion forums to ensure generalisability of findings.

5.1. Conformity in realistic online settings

We observed an overall conformity rate of 31% which is within range of conformity rates reported by prior work (30–39%) investigating online conformity in controlled settings (Wijenayake et al., 2019; 2020c). Therefore, the first contribution of this study is to extend prior findings with regard to the occurrence of social conformity in controlled laboratory settings to realistic online groups. Furthermore, our results also provide empirical evidence on the effects of previously identified conformity determinants (*i.e.*, group size and self-confidence) in realistic online groups. More specifically, the group size difference between the majority-minority (covariate) showed the largest effect on participants' conformity behaviour (with a partial eta squared of 0.17), such that participants felt less 'supported' and more pressured to 'fit in' with the rest of the group (*i.e.* higher susceptibility to *normative* conformity) when challenged by larger majorities. Therefore, these results not only extend observations of controlled conformity studies that reported a positive relationship between group size and conformity in smaller online user groups of 4–6 (*i.e.*, Laporte et al. (2010), Wijenayake et al. (2020c)), to larger ($n = 12$) realistic online group settings, but also imply that users in small-medium scaled online groups are receptive to majority-minority group formation, without having to emphasise this information through platform design.

Furthermore, we observed no significant effects of participants' confidence in their initial opinion on their conformity behaviour. Participants explained that given the subjective nature of the topics discussed in the debates, their initial opinions were based on personal experiences - of which they were confident before being exposed to opposing others' opinions. Hence, our results imply that self-confidence on initial responses may not be predictive of social conformity in subjective contexts, contrary to prior findings where users often conformed

when unsure of their responses to objective tasks (*e.g.,* factual multiple choice quizzes) because of *informational* influences (Lee, 2004; Wijenayake et al., 2019). Furthermore, it is also possible that the remote and asynchronous nature of the debating platform used for this study made participants more comfortable in supporting their personal views despite being challenged by others, in contrast to a controlled laboratory environment where users complete subjective tasks with peers through real-time discussions (Laporte et al., 2010; Wijenayake et al., 2020c). Therefore, while our results are not sufficient to provide a definitive reason for this discrepancy, they imply that effects of conformity determinants reported by controlled laboratory studies can differ from their effects in realistic online groups.

5.2. Effect of platform design on conformity behaviour

While prior work found that *normative* conformity can be encouraged through simple visual, textual, and interaction design elements of website design (Sukumaran et al., 2011), these findings are not explained in relation to conformity determinants. Hence, they are inadequate to fully understand how conformity influences can be appropriately enhanced or reduced through online platform design. Therefore, this study took an initial step towards investigating how manipulating two popular online conformity determinants - *i.e.* social presence and emphasis on majority-minority group composition - through platform design can potentially influence online user conformity behaviour.

5.2.1. Social presence

We found that participants' conformity behaviour was significantly influenced by the level of social presence insinuated through platform design (with a medium-large effect size), independent of known conformity determinants such as group size difference and initial confidence. More specifically, higher online social presence implied through photographic user representations, higher interactivity and response visibility - led to more frequent conformity behaviour than in their absence. These findings reveal that observations of prior work with regard to effects of social presence on online conformity can generalise from controlled, synchronous online groups (Laporte et al., 2010; Wijenayake et al., 2020c) to more realistic, asynchronous online groups. Additionally, in contrast to prior work, our work also reveals how specific aspects of social presence (*i.e.*, user representation, interactivity, and response visibility) can be realistically manipulated through platform design to control (enhance or reduce) user conformity in online settings.

User representations used in the study were seen to successfully manipulate perceived online social presence and control conformity influences. For instance, participants explained that seeing real photographs and names of users (in *high* social presence conditions) enhanced the perception of communicating with a 'real' person, which made them consider others' opinions more diligently, making them more receptive to opposing opinions. Moreover, participants remarked how they were cautious and thoughtful when responding to others' opinions, when their comments would be presented using their real photograph and name. Conversely, participants were more comfortable expressing unpopular opinions and disregarding others' opinions when they were anonymous (represented by a generic avatar and random usernames in *low* social presence conditions), potentially lowering their likelihood to conform. Therefore, our findings resonate with prior work that suggest high anthropomorphic user representations can lead to more socially desirable responses and agreement within groups (Gong, 2008; Lee and Nass, 2002), while visual anonymity results in lower conformity to group norms (Huang and Li, 2016). Thus, high anthropomorphic and anonymous user representations can be embedded in the design of realistic online groups to enhance and reduce user susceptibility to social conformity influences respectively.

Practically, in situations where conformity is desired, humanising

users representations (using real photographs and names of users) - and consequently their opinions - can significantly enhance *normative* conformity. This would be ideal in situations where conforming to group's accepted norms and standards is encouraged (*e.g.*, in online support groups Sharma and De Choudhury, 2018), and to ensure that users are cautious and 'thoughtful' about their responses in online communities (Sukumaran et al., 2011). On the other hand, our results imply that anonymity is more suitable in situations where diverse viewpoints are more desired than group opinions (*e.g.*, online discussion forums such as Reddit). However, other studies have also shown that the presence of simple cues related to user gender and age (*e.g.*, names, gendered avatars, usernames) can trigger stereotypical perceptions of peer competency that can result in unwarranted conformity behaviour and other stereotypical biases in online groups (Wijenayake et al., 2019; 2021). Hence, using humanised user representations to insinuate positive social behaviours may be useful only in situations where such representations have minimum opportunity to instigate stereotypical behaviour and biases.

Prior work notes how the presence of synchronous interactivity among users (*e.g.*, group discussions on live chat) enhances social presence leading to higher conformity (Laporte et al., 2010; Wijenayake et al., 2020c). Our findings expand existing observations by manipulating interactivity in asynchronous settings (as is often the case in realistic online groups) using a voting mechanism. The ability to upvote and downvote in *high* social presence conditions was used by participants to indicate their agreement or disagreement with others' opinions, thus significantly contributing towards interactivity and engagement among users. Participants perceived voting on answers as a more convenient form of providing and receiving feedback (in comparison to posting replies in *low* social presence conditions), which contributed towards the awareness of others as well as their opinions - indicating heightened perceived online social presence as previously explained by Tu and McIsaac (2002). Furthermore, participants described that upvotes on a comment signalled its acceptance within the group, consequently encouraging them to mimic the popular opinion, with the expectation of receiving similar support from others (or to 'fit in') - signifying the repercussions of heightened social presence on *normative* conformity influences. However, displaying the online status of users and sending frequent notifications of others' activities on the platform were not equally effective in insinuating interactivity among users.

Hence, our results imply that manipulating online social presence through interactivity is feasible even in asynchronous settings if users are provided more means to communicate in order to provide and receive feedback with minimum effort. We highlight that a platform functionality which aims to enhance social presence through added interactivity is most effective when it adds direct value to the task at hand (*e.g.,* the voting mechanism in comparison to users' online status and notifications). For example, contrary to our findings, Diner et al. (2018) reported using a notification system that directly indicated peer performance in an image tagging task (*i.e.* how many tags were added by peers on a given image) which encouraged participants to achieve 'acceptable' task performance. Thus, our findings imply that interactive functionalities embedded in platform design should be perceived as convenient to use and to add direct value to the task at hand, for them to effectively manipulate online user behaviour. However, we emphasise that certain means of interactivity cannot only enhance the perceived online social presence, but also put more focus on the majority's opinion, making users more susceptible to conformity. For instance, a voting mechanism could be more useful in platforms like Stack Overflow, where objective content is discussed, and emphasising the popular opinion has value. This may not have the same effect when exposure to multiple arguments is useful.

While making users aware that their final opinions will be shown to the group (*i.e.* high response visibility) has been seen to result in higher online conformity (Lee and Nass, 2002; Wijenayake et al., 2020c), our results did not replicate this effect. Participants in *high* social presence

conditions felt no pressure to conform as a result of being informed their final opinions will be publicly visible to others in the group. On the contrary, they preferred seeing the final opinions of the group and perceived it as a summary of the debate. We argue that this contradiction between our results and prior observations is due to the asynchronous nature of the debating platform, whereas prior studies investigating response visibility used synchronous online groups with confederates (Lee and Nass, 2002; Wijenayake et al., 2020c). Hence, our findings confirm that the effect of response visibility on online conformity behaviour is dependent on the level of interactivity offered by an online platform, as emphasised in previous work (Wijenayake et al., 2020c). Therefore, enhancing response visibility to encourage conformity behaviour may only be effective considering the level of interactivity offered by the platform.

In conclusion, our results emphasise that social presence can be effectively manipulated through platform design to encourage or discourage online conformity influences. Furthermore, social presence has also been seen to impact platform attractiveness (Hassanein and Head, 2007), user involvement and interaction (Fortin and Dholakia, 2005), user satisfaction (Gunawardena and Zittle, 1997; Richardson and Swan, 2003), and trust (Hassanein and Head, 2004). Hence, deciding whether to control conformity influences by manipulating social presence should be carefully considered based on the requirements of each platform. Future work is required to understand how manipulating social presence, in an attempt to control online conformity behaviour could also impact the above aspects of a platform.

5.2.2. Emphasis on majority-minority group composition

The platform's *high* or *low* emphasis on majority-minority group composition did not have statistically significant effects on user conformity. However, our qualitative findings indicate that the *high* vs. *low* emphasis designs used in the experiment were successful in manipulating users' receptiveness to others' opinions. In other words, segregating 'for' and 'against' opinions in the *high* emphasis design was seen to successfully enhance user awareness of how one's personal opinion compared against the overall group opinion - in comparison to the *low* emphasis design. As a result, users who supported the minority's opinion on a given topic reportedly felt more pressure to conform primarily as a result of being singled out by the *high* emphasis platform design - implying consequences of heightened *normative* influences.

Furthermore, the *high* vs. *low* emphasis designs also affected how users perceived platform goals (debate vs. discussion) and consumed the available information. With *high* emphasis on the two groups, participants often chose to selectively read through comments that aligned with their personal opinions - implying that online 'echo chambers' may have manifested (Del Vicario et al., 2016; Garimella et al., 2018) as a result of the *high* emphasis design used. Previously, Liao and Fu (2013) has shown that echo chambers can originate when opposing opinions are presented side-by-side, as users who are heavily involved in a topic perceive a significant threat from their challengers. Hence, it is probable that similar confounds may have nullified effects of the reportedly heightened *normative* social pressures in our study - which also explains the non-significant effect on conformity. We further emphasise that above echo chamber effects could be more profound if users saw group opinions before submitting their own response - as seen in many real-world online group forums and discussion platforms (*e.g.,* Kialo, Reddit, Quora). Thus, future work is needed to fully understand how platform design can effectively emphasise group composition to leverage its effects on conformity behaviour.

Alternatively, in the *low* emphasis design the absence of segregation made participants more comfortable supporting unpopular opinions and likely exposed them to a diverse set of opinions before making a final decision. Therefore, in situations where a platform intends to expose users to diverse perspectives to facilitate better-informed decision making, a *low* emphasis design would be useful. Furthermore, as social conformity is often regarded as detrimental to the quality of group

decisions in computer-mediated settings (Postmes and Lea, 2000), our findings provide valuable insights on how such negative outcomes could be avoided through appropriate platform design.

5.3. Limitations

We note the following limitations of our study. First, while our participants came from different educational backgrounds and levels, they demonstrated above-average computer literacy which may have influenced their susceptibility to online conformity influences. Therefore, further work is needed to ensure that our observations are applicable to a broader population.

Additionally, while we asked all our participants to compare how different platform designs (*e.g. low* vs. *high* social presence designs) would affect their tendency to conform (or not), each participant interacted with only one platform design during the experiment. Therefore, while this qualitative data can provide a general understanding on the effectiveness of platform designs used in manipulating *high* and *low* perceived social presence and emphasis on group composition, these results are not based on *in situ* experience of multiple platform designs and are therefore speculative.

Furthermore, this study only investigated the effects of three aspects of social presence (user representation, interactivity, and response visibility - based on findings of prior work (Laporte et al., 2010; Lee and Nass, 2002; Wijenayake et al., 2020c)), and two approaches of illustrating the majority-minority group compositions (based on websites currently in use), manipulated through platform design to influence conformity. However, online social presence can manifest in many other means (*e.g.*, social context, online communication (Tu and McIsaac, 2002)), which were not considered in this study to avoid overly complicating the experimental setup. Moreover, the aspects of social presence we did consider can also manifest in other ways. For example, interactivity can be determined through communication style, strategy, and formality of language (Tu and McIsaac, 2002). Similarly, there are other ways in which platforms can illustrate majority-minority group composition. Therefore, we note that our study is an initial step, and that future work can extend our work to investigate how other platform designs could influence online conformity behaviour.

6. Conclusion

This experiment aimed to investigate how social conformity manifests in realistic online settings, and determine whether conformity influences can be manipulated through platform design. We deployed four design variations of a debating website, manipulating platform's social presence and emphasis on majority–minority group composition. Our results establish that conformity is apparent in realistic online groups, and with similar strength as observed in prior studies focused on controlled group settings. We found that conformity behaviour was significantly influenced by the level of social presence offered through the platform's design, after accounting for effects of majority–minority group size difference and initial confidence (well-known determinants of conformity in online settings). We compare our findings with observations of prior work on conformity in controlled settings, highlighting aspects of online social presence that could be effectively manipulated via platform design to control conformity behaviour. We discuss how our findings can inform the design of future online platforms to encourage conformity when desired and discourage conformity when seen to be detrimental to the platform's goals.

CRediT authorship contribution statement

Senuri Wijenayake: Conceptualization, Methodology, Software, Investigation, Formal analysis, Writing – original draft, Writing – review & editing. **Niels van Berkel:** Formal analysis, Writing – original draft, Writing – review & editing. **Vassilis Kostakos:** Conceptualization, Supervision, Writing – review & editing. **Jorge Goncalves:** Conceptualization, Supervision, Writing – review & editing.

CRediT authorship contribution statement

Senuri Wijenayake: Conceptualization, Methodology, Software, Investigation, Formal analysis, Writing – original draft, Writing – review & editing. **Niels van Berkel:** Formal analysis, Writing – original draft, Writing – review & editing. **Vassilis Kostakos:** Conceptualization, Supervision, Writing – review & editing. **Jorge Goncalves:** Conceptualization, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Asch, S.E., 1951. Groups, Leadership and Men. Carnegie Press, Oxford, England, pp. 177–190.chapter: Effects of group pressure upon the modification and distortion of judgements

Asch, S.E., 1955. Opinions and social pressure. Sci. Am. 193 (5), 31–35.

Beran, T., Drefs, M., Kaba, A., Al Baz, N., Al Harbi, N., 2015. Conformity of responses among graduate students in an online environment. Internet Higher Educ. 25, 63–69.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3 (2), 77–101. https://doi.org/10.1191/1478088706qp063oa.

Brzozowski, M.J., Adams, P., Chi, E.H., 2015. Google+ communities as plazas and topic boards. Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. ACM, New York, NY, USA, pp. 3779–3788. https://doi.org/10.1145/2702123.2702600.

Caine, K., 2016. Local standards for sample size at CHI. Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, p. 981-992. https://doi.org/10.1145/2858036.2858498.

Campbell, J.D., Tesser, A., Fairey, P.J., 1986. Conformity and attention to the stimulus: Some temporal and contextual dynamics. J. Pers. Soc. Psychol. 51 (2), 315–324.

Cohen, J., 1988. Statistical Power Analysis for the Behavioral Sciences. Lawrence Erlbaum Associates.

Colliander, J., 2019. æthis is fake newsg: Investigating the role of conformity to other users views when commenting on and spreading disinformation in social media. Comput. Hum. Behav. 97, 202–215.

Connell, J.B., Mendelsohn, G.A., Robins, R.W., Canny, J., Canny, J., 2001. Effects of communication medium on interpersonal perceptions. Proceedings of the 2001 International ACM SIGGROUP Conference on Supporting Group Work. ACM, pp. 117–124.

Del Vicario, M., Vivaldo, G., Bessi, A., Zollo, F., Scala, A., Caldarelli, G., Quattrociocchi, W., 2016. Echo chambers: emotional contagion and group polarization on facebook. Sci. Rep. 6, 37825.

Deutsch, M., Gerard, H.B., 1955. A study of normative and informational social influences upon individual judgment. J. Abnorm. Soc. Psychol. 51 (3), 629–636.

Diner, D., Nakayama, S., Nov, O., Porfiri, M., 2018. Social signals as design interventions for enhancing citizen science contributions. Inf. Commun. Soc. 21 (4), 594–611.

Farzan, R., Dabbish, L.A., Kraut, R.E., Postmes, T., 2011. Increasing commitment to online communities by designing for social presence. Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work, pp. 321–330.

Fortin, D.R., Dholakia, R.R., 2005. Interactivity and vividness effects on social presence and involvement with a web-based advertisement. J. Bus. Res. 58 (3), 387–396.

Garimella, K., De Francisci Morales, G., Gionis, A., Mathioudakis, M., 2018. Political discourse on social media: echo chambers, gatekeepers, and the price of bipartisanship. Proceedings of the 2018 World Wide Web Conference, pp. 913–922.

Goldberg, S.C., 1954. Three situational determinants of conformity to social norms. J. Abnorm. Soc. Psychol. 49 (3), 325–329.

Goncalves, J., Kostakos, V., Venkatanathan, J., 2013. Narrowcasting in social media: effects and perceptions. Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining. ACM, New York, NY, USA, pp. 502–509.

Gong, L., 2008. How social is social responses to computers? The function of the degree of anthropomorphism in computer representations. Comput. Hum. Behav. 24 (4), 1494–1509.

Gooch, D., Kelly, R., Stiver, A., van der Linden, J., Petre, M., Richards, M., Klis-Davies, A., MacKinnon, J., Macpherson, R., Walton, C., 2020. The benefits and challenges of using crowdfunding to facilitate community-led projects in the context of digital civics. Int. J. Hum.-Comput. Stud. 134, 33–43. https://doi.org/10.1016/j.ijhcs.2019.10.005.

Goodmon, L.B., Gavin, D.J., Urs, M., Akus, S.N., 2020. The power of the majority: social conformity in sexual harassment punishment selection. J. Appl. Soc. Psychol. 50 (8), 441–455.

Gunawardena, C.N., 1995. Social presence theory and implications for interaction and collaborative learning in computer conferences. Int. J. Educ.Telecommun. 1 (2), 147–166.

Gunawardena, C.N., Zittle, F.J., 1997. Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. Am. J. Distance Educ. 11 (3), 8–26.

Hassanein, K., Head, M., 2007. Manipulating perceived social presence through the web interface and its impact on attitude towards online shopping. Int. J. Hum.-Comput. Stud. 65 (8), 689–708.

Hassanein, K.S., Head, M., 2004. Building online trust through socially rich web interfaces. Proceedings of the 2nd Annual Conference on Privacy, Security and Trust, Fredericton, New Brunswick, Canada, pp. 15–22.

Huang, G., Li, K., 2016. The effect of anonymity on conformity to group norms in online contexts: a meta-analysis. Int. J. Commun. 10 (1), 398–415.

Hullman, J., Adar, E., Shah, P., 2011. The impact of social information on visual judgments. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, New York, NY, USA, pp. 1461–1470. https://doi.org/10.1145/1978942.1979157.

Insko, C.A., Smith, R.H., Alicke, M.D., Wade, J., Taylor, S., 1985. Conformity and group size: the concern with being right and the concern with being liked. Pers. Soc. Psychol. Bull. 11 (1), 41–50.

Laporte, L., van Nimwegen, C., Uyttendaele, A.J., 2010. Do people say what they think: social conformity behavior in varying degrees of online social presence. Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries. ACM, New York, NY, USA, pp. 305–314.

Lee, E.-J., 2003. Effects of 'gender' of the computer on informational social influence: the moderating role of task type. Int. J. Hum.-Comput. Stud. 58 (4), 347–362.

Lee, E.-J., 2004. Effects of gendered character representation on person perception and informational social influence in computer-mediated communication. Comput. Hum. Behav. 20 (6), 779–799.

Lee, E.-J., 2007. Wired for gender: experientiality and gender-stereotyping in computer-mediated communication. Media Psychol. 10 (2), 182–210.

Lee, E.-J., Nass, C., 2002. Experimental tests of normative group influence and representation effects in computer-mediated communication: when interacting via computers differs from interacting with computers. Hum. Commun. Res. 28 (3), 349–381.

Liao, Q.V., Fu, W.-T., 2013. Beyond the filter bubble: interactive effects of perceived threat and topic involvement on selective exposure to information. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 2359–2368.

Maruyama, M., Robertson, S.P., Douglas, S., Raine, R., Semaan, B., 2017. Social watching a civic broadcast: understanding the effects of positive feedback and other users' opinions. Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing. ACM, New York, NY, USA, pp. 794–807.

Maruyama, M.T., Robertson, S.P., Douglas, S.K., Semaan, B.C., Faucett, H.A., 2014. Hybrid media consumption: how tweeting during a televised political debate influences the vote decision. Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing. ACM, New York, NY, USA, pp. 1422–1432.

McKenna, K.Y., Green, A.S., 2002. Virtual group dynamics. Group Dyn. Theory Res. Pract. 6 (1), 116–127.

Melcer, E.F., Isbister, K., 2018. Bots & (main)frames: exploring the impact of tangible blocks and collaborative play in an educational programming game. Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, p. 1-14. https://doi.org/10.1145/3173574.3173840.

Mullen, B., 1983. Operationalizing the effect of the group on the individual: a self-attention perspective. J. Exp. Soc. Psychol. 19 (4), 295–322.

Nowak, K.L., Biocca, F., 2003. The effect of the agency and anthropomorphism on users' sense of telepresence, copresence, and social presence in virtual environments. Presence Teleoperators Virtual Environ. 12 (5), 481–494.

Postmes, T., Lea, M., 2000. Social processes and group decision making: anonymity in group decision support systems. Ergonomics 43 (8), 1252–1274.

Reynolds, B., Venkatanathan, J., Gonçalves, J., Kostakos, V., 2011. Sharing ephemeral information in online social networks: privacy perceptions and behaviours. In: Campos, P., Graham, N., Jorge, J., Nunes, N., Palanque, P., Winckler, M. (Eds.), Human-Computer Interaction – INTERACT 2011. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 204–215.

Richardson, J., Swan, K., 2003. Examination social presence in online courses in relation to students' perceived learning and satisfaction. J. Asynchronous Learn. 7 (1), 68–88.

Rosander, M., Eriksson, O., 2012. Conformity on the internet–the role of task difficulty and gender differences. Comput. Hum. Behav. 28 (5), 1587–1595.

Rosenberg, L., 1961. Group size, prior experience, and conformity. J. Abnorm. Soc. Psychol. 63 (2), 436–437.

Sanders, R., Linn, A., Araujo, T., Vliegenthart, R., van Eenbergen, M., van Weert, J., 2020. Different platforms for different patients needs: automatic content analysis of different online health information platforms. Int. J. Hum.-Comput. Stud. 137 https://doi.org/10.1016/j.ijhcs.2019.102386.

Sharma, E., De Choudhury, M., 2018. Mental health support and its relationship to linguistic accommodation in online communities. Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems. ACM, New York, NY, USA, pp. 641:1–641:13.

Short, J., Williams, E., Christie, B., 1976. The Social Psychology of Telecommunications. John Wiley & Sons.

Stang, D.J., 1976. Ineffective deception in conformity research: some causes and consequences. Eur. J. Soc. Psychol. 6 (3), 353–367.

Sukumaran, A., Vezich, S., McHugh, M., Nass, C., 2011. Normative influences on thoughtful online participation. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, New York, NY, USA, pp. 3401–3410.

Tesser, A., Campbell, J., Mickler, S., 1983. The role of social pressure, attention to the stimulus, and self-doubt in conformity. Eur. J. Soc. Psychol. 13 (3), 217–233.

Tu, C.-H., McIsaac, M., 2002. The relationship of social presence and interaction in online classes. Am. J. Distance Educ. 16 (3), 131–150.

Wijenayake, S., van Berkel, N., Goncalves, J., 2020. Bots for research: minimising the experimenter effect. International Workshop on Detection and Design for Cognitive Biases in People and Computing Systems. ACM.

Wijenayake, S., van Berkel, N., Kostakos, V., Goncalves, J., 2019. Measuring the effects of gender on online social conformity. Proc. ACM Hum.-Comput. Interact. 3 (CSCW), 145:1–145:24. https://doi.org/10.1145/3359247.

Wijenayake, S., van Berkel, N., Kostakos, V., Goncalves, J., 2020. Impact of contextual and personal determinants on online social conformity. Comput. Hum. Behav. 108 (106302), 1–11. https://doi.org/10.1016/j.chb.2020.106302.

Wijenayake, S., van Berkel, N., Kostakos, V., Goncalves, J., 2020. Quantifying the effect of social presence on online social conformity. Proc. ACM Hum.-Comput.Interact. 4 (CSCW1), 1–22.

Wijenayake, S., Hettiachchi, D., Hosio, S.J., Kostakos, V., Goncalves, J., 2020. Effect of conformity on perceived trustworthiness of news in social media. IEEE Internet Comput. 1–8. https://doi.org/10.1109/MIC.2020.3032410.

Wijenayake, S., Hu, J., Kostakos, V., Goncalves, J., 2021. Quantifying the effects of age-related stereotypes on online social conformity. In: Ardito, C., Lanzilotti, R., Malizia, A., Petrie, H., Piccinno, A., Desolda, G., Inkpen, K. (Eds.), Human-Computer Interaction – INTERACT 2021. Springer International Publishing, Cham, pp. 451–475.

Winkler, R., Hobert, S., Salovaara, A., Söllner, M., Leimeister, J.M., 2020. Sara, the lecturer: improving learning in online education with a scaffolding-based conversational agent. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, p. 1-14. https://doi.org/10.1145/3313831.3376781.

Yuan, A., Luther, K., Krause, M., Vennix, S.I., Dow, S.P., Hartmann, B., 2016. Almost an expert: the effects of rubrics and expertise on perceived value of crowdsourced design critiques. Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing. Association for Computing Machinery, New York, NY, USA, p. 1005-1017. https://doi.org/10.1145/2818048.2819953.

Zhang, B., Xu, H., 2016. Privacy nudges for mobile applications: effects on the creepiness emotion and privacy attitudes. Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing. Association for Computing Machinery, New York, NY, USA, p. 1676-1690. https://doi.org/10.1145/2818048.2820073.

Zhu, H., Huberman, B., Luon, Y., 2012. To switch or not to switch: Understanding social influence in online choices. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, New York, NY, USA, pp. 2257–2266.

Senuri Wijenayake is a PhD candidate at the University of Melbourne, Australia. Her research interests include Social Computing and Human-Computer Interaction. Senuri's doctoral research investigates how online group settings can be designed accounting for socio-psychological factors such as social conformity. She holds a B.Sc. (Hons) in Information Technology from University of Moratuwa, Sri Lanka. Contact her at swijenayake@student.unimelb.edu.au.

Niels van Berkel is an Associate Professor in Human-Centred Computing at Aalborg University, Denmark. His research interests lay in Human-Computer Interaction, Social Computing, and Ubiquitous Computing. He received a PhD in Computer Science and Engineering from the University of Melbourne, Australia. Contact him at nielsvanberkel@cs.aau.dk.

Vassilis Kostakos is a Professor of Human-Computer Interaction at the University of Melbourne, Australia. His research interests include ubiquitous computing, human-computer interaction, and social computing. Vassilis received a PhD in Computer Science from the University of Bath. Contact him at vassilis.kostakos@unimelb.edu.au.
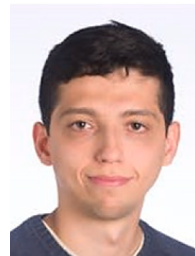
Jorge Goncalves is a Senior Lecturer in Human-Computer Interaction in the School of Computing and Information Systems at the University of Melbourne. He received a PhD with distinction in Computer Science and Engineering from the University of Oulu. His research interests include Human-Computer Interaction, Social Computing, Ubiquitous Computing, Crowdsourcing and Virtual Reality. Contact him at jorge.goncalves@unimelb.edu.au.